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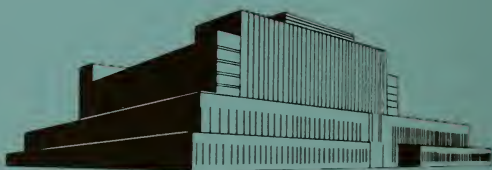
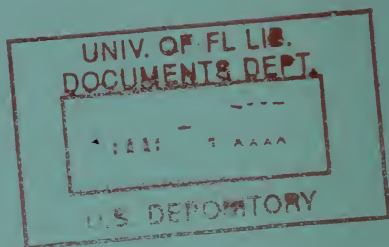


DIVIDENDS FROM WOOD RESEARCH



Recent Publications of the
Forest Products Laboratory
January 1 to June 30, 1968
Forest Service
U.S. Department of Agriculture





DIVIDENDS FROM WOOD RESEARCH

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Publications marked with an asterisk (*) are not available at the Laboratory. They may be consulted at most college and public libraries, or obtained from the publisher.

Reports of slight interest to the layman are designated "Highly technical."



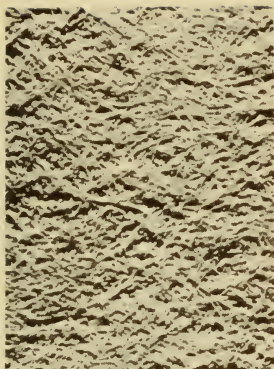
1. Construction of Nu-frame research house (Utilizing new wood-frame system), by L. O. Anderson. U.S. Forest Serv. Res. Paper FPL 88, 41 pp., Mar. 1968.

The cost of housing can be cut by making more economical use of (1) labor or (2) materials. A new concept of house construction developed at FPL, called Nu-frame, does both.

Conventional and new materials are ingeniously combined in walls and roof to reduce fabrication costs. The walls are made of three basic components that can be shop fabricated for later assembly at the site. Framework consists of conventional 2 by 4 studs doubled and spaced 4 feet on center, 2 by 4 plates, and a fiberboard diaphragm that affords both heat and sound insulation. The exterior is faced with a component combining sheathing and siding. The interior is faced with a third component, consisting of gypsum board reinforced with 1- by 6-inch lumber. Both the exterior and the interior wall component are fastened to framing with mastic adhesive and a minimum number of nails to hold down site labor costs.

The roof is framed with trusses of a new design, called dual chord, which permits 4-foot instead of conventional 2-foot spacing. Covering consists of a lumber-plywood sheathing, to the weather side of which is bonded a durable plastic film of polyvinyl fluoride. This covering is fastened to the trusses with mastic adhesive and one nail per truss.

Reduction in amount of dimension lumber used and extensive use of low-grade 1-inch boards provide further substantial savings in material costs.



2. Kraft pulps, papers, and linerboard from southern pine thinnings, by D. J. Fahey and J. F. Laundrie. U.S. Forest Serv. Res. Note FPL-0182, 8 pp., Jan. 1968.

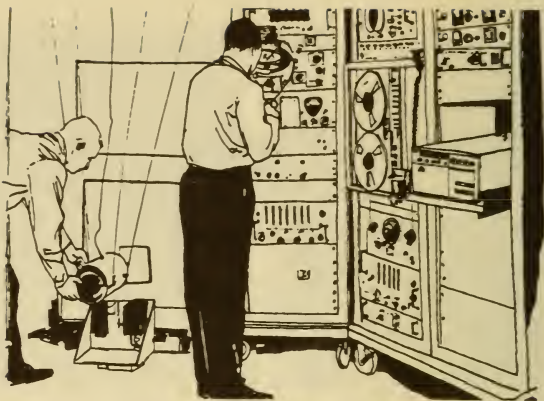
Also published under the title "Southern Pine Thinnings for Papermaking," in *Southern Pulp & Paper Manufacture* 31(8):102-103, Mar. 10, 1968.

Superior printing and tissue papers can be made from the wood of young immature loblolly pine trees. The printing papers are smoother and the tissues softer and more absorbent than similar papers made from mature wood of this southern pine species, pilot-scale experiments demonstrated.

The 8-year-old trees used were typical of those normally thinned from plantations to give remaining trees room to grow to maturity. Their wood is generally weaker and lighter in weight than that of mature trees. Its softer fibers, however, were found to contribute superior properties to the bleached kraft pulps used for the experimental printing and tissue papers.

The same experiments showed that unbleached pulps made from thinnings yield kraft liners for corrugated containerboard that are better formed and stronger, except in tear resistance, than comparable liner stock made from mature wood.

Research Note FPL-0182 describes the pulping, bleaching, and papermaking procedures used and gives detailed findings on the woods, pulps, and papers discussed. Similar exploratory pulping experiments conducted on thinnings of slash pine, another southern pine species, are also reported.



3. Container effects in cushioned packages: Urethane foam cushioning applied as side pads, by C. A. Jordan. U.S. Forest Serv. Res. Paper FPL 91, 20 pp., Apr. 1968.

Does a container enhance or detract from the protection afforded its contents by cushioning?

The answer to that question is being sought in a new line of packaging research under way at FPL. First findings are reported in Research Paper FPL 91.

The shock-absorbing capacity of cushioning, points out the author, is generally determined by striking it with falling masses of various weights. The conditions of this test differ, he notes, from actual service conditions inside a container.

The exploratory experiments reported by the author show pronounced container effects on shock-absorbing properties of cushioning. Dummy loads of various weights were cushioned in cleated plywood and corrugated fiberboard containers, both of which are extensively used by the Air Force, which supported the research. Electric accelerometers mounted in the load measured the acceleration, in gravity units, generated when the package was dropped 2 feet onto a concrete base.

The cleated plywood boxes showed a clear advantage in helping to absorb shock forces under the test conditions. The experiments also demonstrated that the shock spectrum, graphically represented as the natural vibration frequency of hypothetical mechanical elements of the load plotted against their peak response acceleration, is a more accurate criterion of damage potential than the peak acceleration of the load in a cushioned package.

Other Recent FPL Publications

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BOARD AND PANEL MATERIAL

4. Portable apparatus for measuring surface irregularities in panel products, by F. V. Hefty and J. K. Brooks. U.S. Forest Serv. Res. Note FPL-0192, 12 pp., May 1968.

Portable apparatus developed at the Forest Products Laboratory makes possible approximate measurement of vertical deformations on wood surfaces. Fixed-focus camera unit provides photographs of surface under study, using a shadow-casting technique.

5. Steam post-treatments to reduce thickness swelling of particleboard (Exploratory study), by B. G. Heebink and F. V. Hefty. U.S. Forest Serv. Res. Note FPL-0187, 29 pp., Mar. 1968.

For post-treatment, special apparatus was designed for a small hotpress so that particleboards could be steamed, with or without restraint against thickness swelling. Ten-minute treatments at 360° F. saturated steam, without restraint, were exceedingly effective in removing springback.

DRYING

6. Prevention of pinkish-brown discoloration in drying maple sapwood, by John M. McMillen. U.S. Forest Serv. Res. Note FPL-0193, 9 pp., May 1968.

Hard maple lumber producers have difficulty in consistently kiln drying the wood to a light natural color. This experiment showed that either white or discolored lumber could be produced during the kiln drying of air-dried or summer-cut green 5/4 hard maple by adjusting kiln conditions.

7. Transverse strains during drying of 2-inch ponderosa pine, by John M. McMillen. U.S. Forest Serv. Res. Paper FPL 83, 28 pp., Jan. 1968.

Quantitative information is given on drying times, strains, and sets as affected by type of wood, EMC reduction pattern, and temperature. Results provide a basis for computation of drying stresses, possible modification of moisture movement theory and kiln schedule modification to control checking in denser pieces of some softwoods.

8. Forest Products Laboratory list of publications on the drying of wood, 29 pp., Mar. 1968.

Includes publications that give general information and the results of research by the U.S. Forest Service on experimental and applied kiln drying, physical properties, air drying, and steam bending.

- * Accelerated methods of drying thick-sliced and thin-sawed loblolly pine, by K. E. Kimball. Forest Prod. J. 18(1):31-38, Jan. 1968.

This investigation clearly indicates that it is technically feasible to dry thick-sliced and thin-sawed loblolly pine very rapidly by press or jet drying as compared to kiln drying or air drying and that further research and development work is merited.

FIRE PERFORMANCE

9. Effect of inorganic salts on pyrolysis of wood, cellulose, and lignin determined by differential thermal analysis, by Walter K. Tang and Herbert W. Eickner. U.S. Forest Serv. Res. Paper FPL 82, 37 pp., Jan. 1968.

Pyrolysis and combustion reactions of wood are analyzed by differential thermal analysis conducted in both helium and oxygen atmospheres on wood, cellulose, and lignin, untreated and treated with 2 and 8 percent by weight of eight inorganic salts and an acid.

10. Specific heat of wood--further research required to obtain meaningful data, by F. C. Beall. U.S. Forest Serv. Res. Note FPL-0184, 8 pp., Feb. 1968.

Discusses current data on the specific heat of wood and the limitations, particularly when considered for use in analysis of heat transfer in wood drying, fire performance, and other high-temperature applications.

GLUES AND GLUED PRODUCTS

11. Contribution of end-wall and lumen bonding to strength of butt joints, by J. T. Quirk, T. T. Kozlowski, and R. F. Blomquist. U.S. Forest Serv. Res. Note FPL-0179, 14 pp., Jan. 1968.

Magnitude of the difference in tensile strength between earlywood and latewood joints was directly associated with the capacity of the bonds, adhesive-end wall and adhesive-lumen perimeter, to distribute stress. End wall bonding was independent of adhesive age; glue penetration into open cell lumens provided continuity in the joint.

12. Fluorescence microscopy for detecting adhesives on fracture surfaces, by John T. Quirk. U.S. Forest Serv. Res. Note FPL-0191, 2 pp., Apr. 1968.

When wood-adhesive joints fail, it is sometimes difficult to judge whether failure is in adhesion or cohesion. Fluorescence microscopy proved to be a fast and efficient way of examining surfaces. If adhesive is present on the wood surface, it masks the natural bluish autofluorescence of the wood even though the adhesive itself may fluoresce.

13. Forest Products Laboratory list of publications on glue, glued products, and veneer, 32 pp., Apr. 1968.

Includes publications that present the results of research by the Forest Products Laboratory on the development of water-proof glues, preparation and application of various glues, and plywood manufacturing problems.

MECHANICAL PROPERTIES

14. Mechanical properties and specific gravity of a randomly selected sample of spruce pine, by B. A. Bendtsen. U.S. Forest Serv. Res. Paper FPL 92, 8 pp., May 1968.

Presents the first mechanical properties reported for spruce pine (Pinus glabra), as determined from a randomly selected sample.

15. Method for evaluating shear properties of wood, by B. P. Munthe and R. L. Ethington. U.S. Forest Serv. Res. Note FPL-0195, 19 pp., June 1968.

A test procedure is described for determining shear properties of wood where shear stress is in radial or tangential planes.

- * Structural engineering research in wood, by Billy Bohannon. J. of the Structural Div.; Proc. of ASCE 94(ST2):403-416, Feb. 1968.

Four structural engineering research studies of wood beams, in progress or recently completed at the Forest Products Laboratory, are presented and discussed. These studies include

size-bending strength relationship of wood beams, lateral stability of deep beams, tapered wood beams, and prestressed laminated wood beams.

16. Finite element techniques for orthotropic plane stress and orthotropic plate analysis, by A.C. Maki. U.S. Forest Serv. Res. Paper FPL 87, 45 pp., June 1968.

Develops finite element techniques for use in plane stress problems involving such orthotropic materials as wood and plywood. (Highly technical)

17. Hardness modulus as an alternate measure of hardness to the standard Janka ball for wood and wood-base materials, by Wayne C. Lewis. U.S. Forest Serv. Res. Note FPL-0189, 13 pp., Mar. 1968.

Comparisons of Janka-ball hardness values with hardness modulus (load versus depth of penetration of the hardness tool) on representative wood and wood-base materials indicate that a constant relationship exists between the two values.

- * Load distribution in multiple-bolt tension joints, by Calvin O. Cramer. J. of Structural Div., Proc. of Amer. Soc. of Civil Engineers ST 5, 1101-1117, May 1968.

Presents investigation of the distribution of bolt loads in multiple-bolt tension joints having several bolts in a row. An analytical method is derived that closely predicts experimental results showing uneven distribution of loads to bolts. The two end bolts together usually carry more than one-half the load.

PACKAGING

18. Flat-crush cushioning capability of corrugated fiberboard pads under repeated loading, by R. K. Stern. U.S. Forest Serv. Res. Note FPL-0183, 27 pp., Feb. 1968.

To provide information on ability of corrugated fiberboard to cushion against repetitive shocks, the Forest Products Laboratory evaluated cushioning capability of two to five layers of A- and B-flute corrugated fiberboard under impact conditions.

- * Tests show corrugated pads' performance as cushioning, by R. K. Stern. Package Engineering, Feb. 1968.

Research with 1-5 layer, B- and C-flute fiberboard pads established (1) their shock absorption effectiveness, quantitatively; (2) that cushioning effectiveness increases with flute size; and (3) that pads having even numbers of layers are more effective as shock absorbers than those with odd numbers.

SAWING AND MACHINING

19. The "taper-tension" saw--a new reduced kerf saw, by Hiram Hallock, U.S. Forest Serv. Res. Note FPL-0185, 8 pp., June 1968.

Presents design characteristics and performance data for a new circular saw that reduces kerf by about 3/32 inch when sawing pine cants into 4/4 boards.

- * Sacrificing short butt log to chips may reduce lodgepole stud warping, by F. B. Malcolm. Forest Industries 95(5):88-89, May 1968.

Demonstrates that certain internal growth characteristics in the first 4-foot butt length of small diameter trees of lodgepole pine had a strong influence on crook and bow in studs sawed from logs produced from this tree length area.

- * Warp in studs from small-diameter loblolly pine, by F. B. Malcolm. South. Lbrman. 216(2687): 27-30, Apr. 1, 1968.

Maximum crook and bow deflection measurements in the length of studs were found to be greatest in the first 46 inches of length, as measured from the butt end of the stud. Average deflection values were markedly lower in studs from butt logs than from upper logs.

20. Forest Products Laboratory list of publications on milling and utilization of timber products, 30 pp., Mar. 1968.

Includes publications on methods and practices in the lumber producing and wood-consuming industries; standard lumber grades, sizes, and nomenclature; production and use of small dimension stock; specifications for small wooden products; utilization of little-used species and commercial woods; and low-grade and residue surveys.

- * Effects of roller-bar compression and restraint in slicing wood 1 inch thick, by C. C. Peters, R. R. Zenk, and A. Mergen. Forest Prod. J. 18(1):75-80, Jan. 1968.

Chestnut oak, Douglas-fir, and yellow-poplar were sliced 1 inch thick on a modified milling machine equipped with a

conventional knife and 1-1/4-inch-diameter pressure bar that applied various amounts of compression and restraint. Hot cutting with moderate compression and restraint appeared best. Forces as high as 2,180 pounds per inch of length were recorded.

STRUCTURE AND GROWTH CONDITIONS

- * A new method for marking xylem growth, by Karl E. Wolter. Forest Science 14(1):102-104, Mar. 1968.

A new method is described for marking the position of the cambial zones and differentiating xylem during the growing season. Minute injury to the cambial zone with micro-needles cause aberrant cells to form; these cells are permanently retained as a mark with the annual ring.

21. Observations on form of juvenile core in loblolly pine, by Hiram Hallock. U.S. Forest Serv. Res. Note FPL-0188, 4 pp., Feb. 1968.

Describes results of an investigation on butt and upper logs of loblolly pine, seeking a better definition of the characteristics of juvenile core.

22. Wood quality of loblolly pine after thinning, by Diana M. Smith. U.S. Forest Serv. Res. Paper FPL 89, 12 pp., May 1968.

Compares loblolly pine wood produced 4 years after heavy thinning and pruning of 9-year-old stands with wood of unthinned stands of the same age. A three-fold increase in radial growth was found, accompanied by a significant increase in specific gravity and percentage of latewood.

- * Effect of aphid infestation on properties of grand fir, by A. N. Foulger. Forest Prod. J. 18(1): 43-47, Jan. 1968.

Aphid infestation of grand fir stems resulted in reduced tracheid length and modulus of elasticity and greater fibril angle, ring width, percentage of latewood, specific gravity, and longitudinal shrinkage than would be expected in the absence of aphid attack. Percentage lignin increased and total sugars decreased.

WOOD CHEMISTRY

- * The analysis of low-angle light scattering from simple mixtures, by Daniel Caulfield, Yung-Fang

Yao, and Robert Ullman. In "X-Ray and Electron Methods of Analysis," Plenum Press, 1968. pp. 127-161.

The basic theory of low-angle light scattering is presented. When dealing with simple solids mixtures, the experimental data may be analyzed to provide a measure of particle size, size distribution, surface area, and distance of heterogeneity of the scattering sample. Experimental methods and results on model systems are discussed. (Highly technical)

- * Cell wall density of dry wood, by R. C. Weatherwax and Harold Tarkow. Forest Prod. J. 18(2):83-85, Feb. 1968.

The density of the cell wall of dry wood was measured by displacement of silicone fluids with viscosities 0.65 and 30,000 times that of water. The cell wall density was shown to be independent of the displacement fluid and essentially the same as the density of the cell wall substance. (Highly technical)

- * Gas chromatographic analysis of phenols from lignin, by Ira T. Clark. J. of Chromatography 6: 53-55, Jan. 1968.

Mixtures of catechols, guaiacols and other phenols were resolved by gas chromatography on column that used Apiezon L, Apiezon N, or polyphenyl ether liquid phases. Procedures are described for the quantitative analysis of these mixtures as their trimethylsilyl ethers on these columns. (Highly technical)

- * Hydrolysis of xylan in different species of hardwoods, by Edward L. Springer and Lawrence L. Zoch. Tappi 51(5):214-218, May 1968.

Thin cross sections of quaking aspen, paper birch, American elm, and red maple were hydrolyzed in 0.10M HCL at 120° C. and in distilled water at 170° C. With 0.10M HCL at 120° C. only very small differences in xylan removal rates were observed. In distilled water at 170° C., larger differences were found. (Highly technical)

- * Lignans of Ulmus thomasi heartwood-I. Thomasic Acid, by M. K. Seikel, F. D. Hostettler, and D. B. Johnson. Tetrahedron Vol. 24, pp. 1475-1488. 1968.

The compound principally responsible for the vivid yellow-green fluorescence of basified aqueous extracts of Ulmus thomasi Sarg. heartwood has been shown to be an unusual new cycloolignan in the free acid form with a double bond at Δ^3 . The compound has been named thomasic acid. (Highly technical)

- * New sesquiterpenes from the yellow wood of slippery elm, by M. Fracheboud, J. W. Rowe, 11

R. W. Scott, S. M. Fanega, A. J. Buhl, and J. K. Toda. Forest Prod. J. 18(2):37-40, Feb. 1968.

Slippery elm wood which developed a yellow stain on paint films contained a yellow cadalene derivative, 8-isopropyl-5-methyl-3-hydroxy-2-naphthaldehyde. Its orange-colored 7-methoxy derivative, a tetrahydro derivative, and 7-hydroxycadalene were also identified chemically. The yellow compound being relatively volatile is able to cause staining by migration into paint films. (Highly technical)

- * Preparation and gas chromatography of the trimethylsilyl derivatives of resin acids and the corresponding alcohols, by D. F. Zinkel, Mary B. Lathrop, and L. C. Zank. J. of Gas Chromatography 6(3):158-160, Mar. 1968.

A method for the quantitative trimethylsilylation of resin and fatty acids and the corresponding alcohols is described. The instability of the trimethylsilyl esters limits the liquid phases usable in gas chromatographic analysis. (Highly technical)

- * Production of phenols by cooking kraft lignin in alkaline solutions, by Ira T. Clark and Jesse Green. Tappi 51:44-48, Jan. 1968.

The principal products obtained from the cooking of kraft lignin in solutions of NaOH and Na₂S at temperatures of 260° to 310° C. were: guaiacol, catechol, methyl and ethyl-guaiacols, methyl and ethyl-catechols, phenol, and *p*-cresol. Maximum yields were obtained at 300° C. in 4% NaOH. Inclusion of Na₂S reduced yields. (Highly technical)

- * Separation of resin from fatty acid methyl esters by gel-permeation chromatography, by D. F. Zinkel and L. C. Zank, Analyt. Chem 40:1144-1146, June 1968.

Resin and fatty acid methyl esters are quantitatively separated by gel-permeation chromatography. This preliminary separation simplifies and improves the subsequent gas chromatographic analysis for the individual esters. (Highly technical)

- * The structure and the stereochemistry of abieslactone, by S. Uyeno, J. Okada, S. Matsunaga, and J. W. Rowe. Tetrahedron Vol. 24 (2859-2880). 1968.

Abieslactone, a triterpenoid isolated from several firs (*Abies* spp.) has been shown to be 3 α -methoxylanosta-9(11), 24-dien-27, 23R-olide (I). (Highly technical)

- * The superswollen state of wood, by Harold Tarkow and W. C. Feist. Tappi 51(2):80-83, Feb. 1968.

Superswollen state is that condition of a modified wood having a higher than normal fiber saturation point. It is obtained by chemical pulping and by treating hardwoods with dilute sodium hydroxide or liquid ammonia. Such materials have reduced wet strength, increased transverse diffusion constants, and increased digestibility by cellulolytic micro-organisms. (Highly technical)

WOOD FIBER

- * Deflocculation of swelling clays by nonionic and anionic detergents, by Hans Schott. Journal of Colloid and Interface Science 26:133-139, Feb. 1968.

Describes the deflocculation of suspensions of sodium montmorillonite by nonionic detergents as studied by turbidity, viscosity, and sedimentation volume. The results are discussed in terms of adsorption and of the crystallographical aspects of clay and adsorbed detergent. Anionic detergents did not interact with the clay. (Highly technical)

- * Interactions in the system: Clay-detergent-cellulose, by Hans Schott. Journal of the American Oil Chemists Society 45:414-422, June 1968.

Describes the relationships between montmorillonite and kaolinite clays, nonionic and anionic detergents, and cellulose when brought into contact in water. Discusses the binary systems of clay-cellulose, detergent-cellulose, and clay-detergent as well as the ternary system. (Highly technical)

- * Magnesium bisulfite pulping and papermaking with southern pine, by E. L. Keller and D. J. Fahey. Tappi 51(2):98-103, Feb. 1968.

Describes magnesium bisulfite pulping and papermaking with southern pine in which two-ply linerboard, various printing and writing papers, toweling, and tissue paper of good quality were produced. (Highly technical)

- * Method for measuring edgewise shear properties of paper, by Vance C. Setterholm, Roy Benson, and Edward W. Kuenzi. Tappi 51(5):196-202, May 1968.

Describes an experimental procedure for determining basic shear characteristics of paper under edgewise loading that produces shear distortion in the plane of the sheet. The procedures are suitable for determining stress-strain char-

acteristics to failure so that shear strength, proportional-limit stress, strain, and shear modulus can be obtained. (Highly technical)

- * Microscopical and other fiber characteristics of high-yield sodium bisulfite pulps from balsam fir, by R. A. Horn and F. A. Simmonds. *Tappi* 51(1):67A-73A, Jan. 1968.

Discusses observations by electron, light, and ultraviolet microscopy of pulps in the yield range of 51 to 94 percent at various degrees of beating and their relationship to paper-making properties. (Highly technical)

- * Rheology of molten polymers. Application of the cross equation and the viscosity at infinite shear, by Hans Schott. *Rheologica Acta* 7:179-183, May 1968.

The paper shows how the cross equation, applied to purely viscous flow data of molten polymers measured in the pseudo-plastic region, can be used to calculate the upper Newtonian viscosity. This parameter, which is not accessible experimentally, is of considerable theoretical interest. (Highly technical)

- * Solubilization of a water-insoluble dye as a method for determining micellar molecular weights, and remarks on molecular weight determination of charged micelles by light scattering, by Hans Schott. *Journal of Physical Chemistry* 72:380-382, Jan. 1968.

Compares molecular weight determination of micelles of nonionic and ionic surfactants by the two methods. Discusses the effect of micellar charge on turbidity and the possibility that accurate extrapolation of Debye plots to concentrations low enough to eliminate interparticle repulsion might require dilution below the critical micelle concentration. (Highly technical)

WOOD PRESERVATION

- * Field tests on wood dethiaminized for protection against decay, by L. R. Gjovik and R. H. Baechler. *Forest Prod. J.* 18(1):25-27, Jan. 1968.

Dethiaminization continues to show promise as a simple and inexpensive method of protecting wood against decay organisms. The method, believed adaptable to the kiln drying operation, depends on depriving the fungus of an essential nutrient, Vitamin B-thiamine. The process leaves no residual chemical in wood, thus should not interfere with any fabrication processes.

- * Further thoughts regarding variable performance of creosoted marine piling, by R. H. Baechler. AWP A Proc. 1968.

Reviews changes in commercial creosotes during the 20th century. When conditions favor the depletion or degradation of creosote in marine piling, some supplementary protection is needed. Under moderate conditions, premature destruction by limnoria may be prevented by heavy treatment with creosote that combines high toxicity and permanence in sea water.

- * Retention and distribution of water-borne preservative in redwood treated at different moisture levels, by J. O. Blew, H. G. Roth, and H. L. Davidson. AWP A Proc. 1968.

In a study of the pressure treatment of redwood lumber at 14 moisture levels with chromated copper arsenate, preservative retentions, penetration, and distribution were definitely improved through drying of the lumber below a 50 percent moisture content.

- * Study of paintability and cleanliness of wood pressure treated with water-repellent preservative, by Edw. Panek. AWP A Proc. 1968.

Cleanliness and paintability are difficult to obtain with Douglas-fir and southern pine pressure treated with a water-repellent pentachlorophenol preservative. Outdoor exposure of treated and painted panels for 1 year showed results comparing favorably with those on untreated controls where treated southern pine was conditioned by solvent recovery and painted with an emulsion paint system.

GENERAL

- * Electrical analog approach to heat flow through wood-frame walls, by E. M. Wengert. Forest Prod. J. 18(1):99-101, Jan. 1968.

An analog simulator for studying the combined effects of climate and wall construction was designed and built at the Forest Products Laboratory. The results obtained from the analog simulator are generally verified with actual data obtained from buildings.

- * Moisture distribution in wood-frame walls in winter, by John E. Duff. Forest Prod. J. 18(1): 61-64, Jan. 1968.

Moisture distributions during two winters were measured in three insulated wood-frame wall sections containing different interior vapor barriers. Comparative results among the test

panels clearly demonstrated the importance of a properly installed vapor barrier. Stud moisture conditions were only moderately affected by the moisture conditions in the adjacent panel.

- * Utilizing all species and all of the tree, by Herbert O. Fleischer. Pulp & Paper 42(14):28-30, 32, Apr. 1, 1968.

Pulpwood industry goal of using the whole tree is thoroughly explored in a paper presented at the recent annual American Pulpwood Assn. meeting.

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